

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application : **10/550,344**
Applicant(s) : **VILLAIN et al.**
Filed : **9/22/2008**
Confirmation : **1254**
T.C./Art Unit : **3737**
Examiner : **CWERN, Jonathan**
Atty. Docket : **FR030033US**

**Title: MEDICAL IMAGING SYSTEM AND A METHOD FOR SEGMENTING AN
OBJECT OF INTEREST**

Mail Stop: **APPEAL BRIEF - PATENTS**
Commissioner for Patents
Alexandria, VA 22313-1450

APPEAL UNDER 37 CFR 41.37

Sir:

This is an appeal from the decision of the Examiner dated 23 October 2008, finally rejecting claims 1-10 of the subject application.

This paper includes (each beginning on a separate sheet):

- 1. Appeal Brief;**
- 2. Claims Appendix;**
- 3. Evidence Appendix; and**
- 4. Related Proceedings Appendix.**

APPEAL BRIEF

I. REAL PARTY IN INTEREST

The above-identified application is assigned, in its entirety, to **Koninklijke Philips Electronics N. V.**

II. RELATED APPEALS AND INTERFERENCES

Appellant is not aware of any co-pending appeal or interference that will directly affect, or be directly affected by, or have any bearing on, the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claim 11 is canceled.

Claims 1-10 are pending in the application.

Claims 1-10 stand rejected by the Examiner under 35 U.S.C. 102(b).

Claim 10 stands rejected by the Examiner under 35 U.S.C. 101.

These rejected claims are the subject of this appeal.

IV. STATUS OF AMENDMENTS

An amendment was filed subsequent to the final rejection in the Office Action dated 23 October 2003, but not entered by the Examiner.

V. SUMMARY OF CLAIMED SUBJECT MATTER¹

Independent claim 1 recites a medical imaging system (FIG. 1) comprising:
acquisition means (2) for acquiring a volume of three-dimensional (3D) digital data comprising at least one object of interest (page 4, lines 11-12);
means for segmenting (4) a region of interest comprising said object of interest within said volume of 3D data into a segmented region of interest (page 4, lines 25-26);
means for displaying (3) a two-dimensional (2D) representation of said volume of 3D data and said segmented region of interest (page 8, lines 13-14);
means for determining (5) a sub-regions map within said segmented region of interest (page 6, lines 13-14); and
correction means (6) for correcting the segmented region of interest using said sub-regions map (page 8, lines 33-34).

Independent claim 8 recites a device (FIG. 1; 20 of FIG. 8) for correcting a segmented region, configured to be integrated in a medical imaging system (FIG. 8) which acquires a volume of data and to segment a region of interest around an object of interest within said volume of data (22 of FIG. 8; page 10, lines 21-24), said device comprising:

means for calculating (5 of FIG. 1) a sub-regions map within the segmented region (page 6, lines 13-14); and
correction means (6 of FIG. 1) for excluding sub-regions of said region of interest based on said sub-regions map (page 8, lines 33-34).

¹ It is respectfully noted that it is not the appellants' intention that the claimed embodiments of this invention be limited to operation within the example embodiments described in this brief, beyond what is required by the claim language. These examples and their description are provided to facilitate ease of understanding and to comply with the requirements of an appeal brief, without intending that any further interpreted limitations be read into the claims as presented.

Independent claim 10 recites a method of correcting a segmented region of interest derived from a volume of three-dimensional (3D) digital data comprising at least one object of interest, the method comprising (FIG. 1):

calculating (5) a regions map within the segmented region (page 6, lines 13-14); and

excluding (6) sub-regions of the segmented region based on the sub-regions map (page 8, lines 33-34).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1-10 stand rejected under 35 U.S.C. 102(b) over Demonceau et al. (USP 6,389,310, hereinafter Demonceau).

Claim 9 stands rejected under 35 U.S.C. 112, second paragraph.

Claim 10 stands rejected under 35 U.S.C. 101.

VII. ARGUMENT

Claims 1-10 stand rejected under 35 U.S.C. 102(b) over Demonceau

MPEP 2131 states:

"A claim is anticipated only if *each and every element* as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)... "The *identical invention* must be shown in as *complete detail* as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Claims 1-7 and 9

Demonceau fails to teach segmenting a region of interest comprising an object of interest into a segmented region of interest, determining a sub-regions map within the segmented region of interest, and correcting the segmented region of interest using the sub-regions map, as specifically claimed in claim 1, upon which claims 2-7 and 9 depend.

The Examiner fails to identify which particular element in Demonceau is assumed to correspond to each element of the applicants' claim, and this lack of identification masks the inconsistencies in the Office action.

Demonceau teaches segmenting an image into a segmented region of interest, the defined segmented regions comprising the Aorta descendens (AoD), Spleen (Spl), Left Ventricle (LV), Right Ventricle (RV), Left Auricle (LA), Right Auricle (RA) and other objects, including the Valvular Plane (VP) and Septum (SP) (Demonceau's Stage 3: Determination of the Position of the Heart Cavities and of the Valvular Plane and the Septum; column 19, line 63 – column 24, line 57).

The applicants claim a two-step segmentation process: segmenting a region of interest about an object of interest, and then determining sub-regions within the segmented region.

Demonceau teaches a single level of segmentation that produces a single collection of regions (LV, RV, LA, RA, VP, SP). As Demonceau states: "Knowing the valvular plane and the septum, the program determines the region of interest, i.e. one or more regions selected among LV, RV, LA, RA." (Demonceau, column 24, lines 55-57). Demonceau's determined region of interest comprising one or more selected regions can be said to correspond to the applicants' claimed segmented region of interest.

Demonceau does not teach the subsequent determination of sub-regions within the segmented regions, as specifically claimed by the applicants. The Examiner asserts that any region can be equivalently considered to be a sub-region. The applicants respectfully disagrees with this assertion. A sub-region is only definable with respect to a defined region that is segmented into a plurality of sub-regions.

Demonceau's region LV, for example, cannot be termed a sub-region absent a defined region that includes region LV. The Examiner asserts that the entire heart can be considered the region of interest, and each part of the heart can be considered a sub-region (Office action, page 5, lines 7-9). However, Demonceau does not teach a two-step process of determining a "heart region" and then segmenting this determined heart region into sub-regions LV, RV, LA, RA, which would be required to assert an equivalence between Demonceau's teachings and the applicants' claimed two-step segmentation process.

That is, if the asserted "heart region" is considered to be the region of interest, and the LV, RV, LA, and RA are considered to correspond to the applicants' sub-regions that are within this segmented region of interest, then Demonceau fails to teach the first step of the applicants' claimed invention of segmenting a region of interest comprising an object of interest into a segmented region of interest, to create the asserted "heart region". Demonceau does not teach a "heart region", and does not teach determining such a region; hence, Demonceau's LV, RV, LA, and RA regions cannot be considered to be "sub-regions" of this non-existent heart region.

The Examiner asserts that for "the example of claim 28, lines 24-50, the 4D segments are further labeled as left or right ventricular. That is, they are *further* defined into **smaller regions**, sub-regions." This assertion is incorrect. The left and right ventricles are the regions that are defined in Demonceau's single segmentation process, there is no "further" defining in Demonceau, and no "smaller regions" than the regions that are defined in Demonceau's single segmentation process. The Examiner fails to identify where Demonceau teaches determining a "larger" region from which the asserted "smaller" regions are formed.

Because Demonceau fails to teach segmenting a region of interest comprising an object of interest into a segmented region of interest, determining a sub-regions map within the segmented region of interest, and correcting the segmented region of interest using the sub-regions map, as specifically claimed in claim 1, the applicants respectfully maintain that the rejection of claims 1-7 and 9 under 35 U.S.C. 102(b) over Demonceau is unfounded, and should be reversed by the Board.

Claims 8 and 10

Demonceau fails to teach correcting a segmented region by calculating a sub-regions map within the segmented region and excluding sub-regions of said region of interest based on a determined sub-regions map within the segmented region, as claimed in each of claims 8 and 10.

The Examiner asserts that Demonceau provides this teaching at column 28, lines 40-50. This assertion is incorrect. Demonceau teaches excluding regions that are outside of the regions of interest. As the Examiner notes, at the cited text, Demonceau teaches removing segments at the border of the image and segments isolated in the background (Office action, page 4, lines 7-10). These segments are not within any segmented region, and are eliminated to facilitate the determination of the segmented regions. All of the segments that have a root within a given region of interest are identified as belonging to the given region; none of the segments that are identified as being within the region of interest are eliminated from the region (Demonceau, column 28, lines 39-41).

Because Demonceau fails to teach correcting a segmented region by calculating a sub-regions map within the segmented region and excluding sub-regions of said region of interest based on a determined sub-regions map within the segmented region, the applicants respectfully maintain that the rejection of claims 8 and 10 under 35 U.S.C. 102(b) over Demonceau is unfounded, and should be reversed by the Board.

Claim 10 stands rejected under 35 U.S.C. 101

Claim 10

Claim 10 recites a method of correcting a segmented region of interest derived from a volume of three-dimensional digital data comprising at least one object of interest, the method comprising: calculating a regions map within the segmented region; and excluding sub-regions of the segmented region based on the sub-regions map.

In re Bilski, 545 F.3d 943, 88 USPQ2d 1384 (Fed. Cir. 2008), the court stated:

"In contrast, we held one of Abele's dependent claims to be drawn to patent-eligible subject matter where it specified that "said data is X-ray attenuation data produced in a two dimensional field by a computed tomography scanner." Abele, 684 F.2d at 908-09. This data clearly represented physical and tangible objects, namely the structure of bones, organs, and other body tissues. Thus, the transformation of that raw data into a particular visual depiction of a physical object on a display was sufficient to render that more narrowly-claimed process patent-eligible.

We further note for clarity that the electronic transformation of the data itself into a visual depiction in Abele was sufficient; the claim was not required to involve any transformation of the underlying physical object that the data represented. We believe this is faithful to the concern the Supreme Court articulated as the basis for the machine-or-transformation test, namely the prevention of pre-emption of fundamental principles. So long as the claimed process is limited to a practical application of a fundamental principle to transform specific data, and the claim is limited to a visual depiction that represents specific physical objects or substances, there is no danger that the scope of the claim would wholly pre-empt all uses of the principle."

As noted above, in *Bilski*, the court has maintained that data that represents physical objects, such as data corresponding to X-rays of a person, corresponds to a "physical article", and a method that transforms a physical article into a new form constitutes patentable subject matter. Claim 10 addresses modifying/transforming a 3-D image of a segmented region of interest that represents a physical object by excluding sub-regions within the region of interest. Claim 10 does not pre-empt the fundamental principles of processing 3-D images, and is limited to the particular technique of creating a sub-region map within a segmented region of interest, and eliminating sub-regions based on the sub-region map.

Because the applicants specifically claim a modification/transformation of a 3-D depiction of physical objects, the applicants respectfully maintain that claim 10 is patentable under 35 U.S.C. 101 based on the principles established in *Abele*, and reinforced in *Bilski*.

CONCLUSIONS

Because Demonceau fails to teach segmenting a region of interest into a segmented region of interest, determining a sub-regions map within the segmented region of interest, and correcting the segmented region of interest using the sub-regions map, the applicants respectfully request that the Examiner's rejection of claims 1-7 and 9 under 35 U.S.C. 102(b) be reversed by the Board, and the claims be allowed to pass to issue.

Because Demonceau fails to teach correcting a segmented region by calculating a sub-regions map within the segmented region and excluding sub-regions of said region of interest based on a determined sub-regions map within the segmented region, the applicants respectfully request that the Examiner's rejection of claims 8 and 10 under 35 U.S.C. 102(b) be reversed by the Board, and the claims be allowed to pass to issue.

Because the applicants specifically claim a modification/transformation of a 3-D depiction of physical objects, the applicants respectfully request that the Examiner's rejection of claim 10 under 35 U.S.C. 101 be reversed by the Board, and the claims be allowed to pass to issue.

Respectfully submitted

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CLAIMS APPENDIX

1. A medical imaging system comprising:
 - acquisition means for acquiring a volume of three-dimensional (3D) digital data comprising at least one object of interest;
 - means for segmenting a region of interest comprising said object of interest within said volume of 3D data into a segmented region of interest;
 - means for displaying a two-dimensional (2D) representation of said volume of 3D data and said segmented region of interest;
 - means for determining a sub-regions map within said segmented region of interest; and
 - correction means for correcting the segmented region of interest using said sub-regions map.
2. The medical imaging system as claimed in Claim 1, wherein said means for determining the sub-regions map comprise means for calculating watersheds to form a first sub-regions map within the segmented region of interest.
3. The medical imaging system as claimed in Claim 2, wherein said means for determining the sub-regions map further comprise means for calculating a map of distances, said means for calculating watersheds forming the first sub-regions map based on said map of distances.
4. The medical imaging system as claimed in Claim 2, wherein said means for determining the sub-regions map further comprise means for merging sub-regions of the first map to form a second sub-regions map.
5. The medical imaging system as claimed in Claim 1, further comprising: control means for enabling a user to select the sub-regions to be excluded.

6. The medical imaging system as claimed in Claim 1, wherein said means for displaying the 2D representation display updates which take into account the corrected segmented region of interest provided by the correction means.
7. The medical imaging system as claimed in Claim 1, further comprising: labeling means for labeling the sub-regions map of the segmented region of interest.
8. A device for correcting a segmented region, configured to be integrated in a medical imaging system which acquires a volume of data and to segment a region of interest around an object of interest within said volume of data, said device comprising:
 - means for calculating a sub-regions map within the segmented region; and
 - correction means for excluding sub-regions of said region of interest based on said sub-regions map.
9. The medical imaging as claimed in Claim 1, further comprising: a medical imager comprising means for forming the volume of 3D digital data representing an environment including the object of interest.
10. A method of correcting a segmented region of interest derived from a volume of three-dimensional (3D) digital data comprising at least one object of interest, the method comprising:
 - calculating a regions map within the segmented region; and
 - excluding sub-regions of the segmented region based on the sub-regions map.
11. (Canceled)

EVIDENCE APPENDIX

No evidence has been submitted that is relied upon by the appellant in this appeal.

RELATED PROCEEDINGS APPENDIX

Appellant is not aware of any co-pending appeal or interference which will directly affect or be directly affected by or have any bearing on the Board's decision in the pending appeal.